

CLAIM AMENDMENTS

1. (canceled)

2. (currently amended) The method according to claim 16
[[,]] wherein said channel coefficients to be calculated are
comprised between a first known channel coefficient, of abscissa A,
corresponding to a last pilot symbol of a current slot (L) and a
second known channel coefficient, of abscissa B, corresponding to a
first pilot symbol of a slot (L + 1) subsequent to said current
slot, ~~being additionally known~~ a third channel coefficient [[,]] of
abscissa A-1 [[,]] being on the left-hand of said first channel
coefficient of abscissa A, and the computation of said channel
coefficients ~~[[is]]~~ being carried out through by the following
steps:

a) ~~repeatedly applying in a recursive manner said~~
~~interpolation algorithm in the interval defined by said known~~
~~channel coefficients of abscissa A and B, by carrying out a first~~
~~iteration in an interval defined by the known channel coefficients~~
~~of abscissa A1 and B in which a first intermediate coefficient (of~~
~~abscissa C) is calculated [[;]] and [[by]] performing [[the]]~~
~~subsequent iterations of the same algorithm in sub-intervals [[,]]~~
~~defined each time on the left-hand by said known channel~~
~~coefficient of abscissa A and on the right-hand by the intermediate~~
~~coefficient [[,]] and calculated in the preceding iteration, until~~
~~the abscissa point A + 1 is reached and computed;~~

23 b) searching, by increasing abscissas, for a first point,
24 still to be calculated, on the right-hand of the last intermediate
25 coefficient calculated; defining as extremes of a new application
26 interval of ~~said interpolation algorithm~~, having on the left side
27 the first known left-hand point and on the right side the first
28 known right-hand point with respect to said point still to be
29 calculated; and further ~~applying, in a recursively performing~~
30 further iterations of the method in manner, said interpolation
31 algorithm to said new interval [[,]] by carrying out subsequent
32 iteration of ~~the same algorithm~~ in sub-intervals defined from time
33 to time by the intermediate coefficient calculated in the preceding
34 iteration, until the point immediately adjacent to the left-hand
35 extreme of said new interval is reached and calculated; and
36 c) repeating step b) until the channel coefficient
37 associated to the value of abscissa B-1 is calculated.

1 3. (currently amended) The method according to claim 2
2 [[,]] wherein each slot contains three pilot symbols (0, 1, 2),
3 said first known channel coefficient of abscissa A is the
4 coefficient $C(2) = C_r(2) + C_q(2)$ corresponding to the last pilot
5 symbol (2) of the current slot (L), said second known channel
6 coefficient of abscissa B is the coefficient $C(10) = [[C_r(10)]]$
7 $C_r(10)$ + $jC_q(10)$ corresponding to the first pilot symbol (10) of a
8 subsequent slot (L + 1), and said third known channel coefficient
9 of abscissa A-1 is the coefficient $C(1) = [[C_r(1)]]$ $C_r(1)$ + $C_q(1)$
10 corresponding to the last but one pilot symbol (1) of the current

slot (L) and the computation of channel coefficients $C(k) = [C_I(k)] C_I(k) + jC_Q(k)$, with $k = 3..9$, is performed according to the following sequence:

$$C_I(6) = [C_I(2) + C_I(10)]/2; C_Q(6) = [C_Q(2) + C_Q(10)]/2;$$

$$C_I(4) = [C_I(2) + C_I(6)]/2; C_Q(4) = [C_Q(2) + C_Q(6)]/2;$$

$$C_I(3) = [C_I(2) + C_I(4)]/2; C_Q(3) = [C_Q(2) + C_Q(4)]/2;$$

$$C_I(5) = [C_I(4) + C_I(6)]/2; C_Q(5) = [C_Q(4) + C_Q(6)]/2;$$

$$C_I(8) = [C_I(6) + C_I(10)]/2; C_Q(8) = [C_Q(6) + C_Q(10)]/2;$$

$$C_I(7) = [C_I(6) + C_I(8)]/2; C_Q(7) = [C_Q(6) + C_Q(8)]/2;$$

$$C_I(9) = [C_I(8) + C_I(10)]/2; C_Q(9) = [C_Q(8) + C_Q(10)]/2.$$

4. (currently amended) The method according to claim 2 [[,]] wherein each slot contains four pilot symbols (0, 1, 2, 3), said first known channel coefficient of abscissa A is the coefficient $C(3) = C_I(3) + jC_Q(3)$ corresponding to the last pilot symbol (3) of the current slot (L), said second known channel coefficient of abscissa B is the coefficient ~~original~~ $C(10) = C_I(10) + C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L + 1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(2) = C_I(2) + C_Q(2)$ corresponding to the last but one pilot symbol (2) of the current slot (L), and the computation of the channel coefficients $C(k) = C_I(k) + jC_Q(k)$, with $k = 4..9$, is performed according to the following sequence:

$$C_I(6) = [C_I(2) + C_I(10)]/2; C_Q(6) = [C_Q(2) + C_Q(10)]/2;$$

$$C_I(4) = [C_I(2) + C_I(6)]/2; C_Q(4) = [C_Q(2) + C_Q(6)]/2;$$

$$\begin{aligned}
16 \quad & C_I(5) = [C_I(4) + C_I(6)]/2 ; C_Q(5) = [C_Q(4) + C_Q(6)]/2; \\
17 \quad & C_I(8) = [C_I(6) + C_I(10)]/2; C_Q(8) = [C_Q(6) + C_Q(10)]/2; \\
18 \quad & C_I(7) = [C_I(6) + C_I(8)]/2 ; C_Q(7) = [C_Q(6) + C_Q(8)]/2; \\
19 \quad & C_I(9) = [C_I(8) + C_I(10)]/2; C_Q(9) = [C_Q(8) + C_Q(10)]/2.
\end{aligned}$$

1 5. (currently amended) The method according to claim 2
2 [[,]] wherein each slot contains five pilot symbols (0, 1, 2, 3,
3 4), said first known channel coefficient of abscissa A is the
4 coefficient ~~original~~ $C(4) = C_I(4) + jC_Q(4)$ corresponding to the
5 last pilot symbol (4) of current slot (L), said second known
6 channel coefficient of abscissa B is the coefficient
7 $C(10) = C_I(10) + jC_Q(10)$ corresponding to the first pilot symbol
8 (10) of a subsequent slot (L + 1), and said third known channel
9 coefficient of abscissa A-1 is the coefficient $C(3) = C_I(3) + jC_Q(3)$
10 corresponding to the last but one pilot symbol (3) of the current
11 slot (L), and the computation of the channel coefficients
12 $C(k) = C_I(k) + jC_Q(k)$, with $k = 5..9$, is performed according to
13 following sequence:

$$\begin{aligned}
14 \quad & C_I(7) = [C_I(4) + C_I(10)]/2; C_Q(7) = [C_Q(4) + C_Q(10)]/2; \\
15 \quad & C_I(5) = [C_I(3) + C_I(7)]/2 ; C_Q(5) = [C_Q(3) + C_Q(7)]/2; \\
16 \quad & C_I(6) = [C_I(5) + C_I(7)]/2 ; C_Q(6) = [C_Q(5) + C_Q(7)]/2; \\
17 \quad & C_I(8) = [C_I(6) + C_I(10)]/2; C_Q(8) = [C_Q(6) + C_Q(10)]/2; \\
18 \quad & C_I(9) = [C_I(8) + C_I(10)]/2; C_Q(9) = [C_Q(8) + C_Q(10)]/2.
\end{aligned}$$

1 6. (currently amended) The method according to claim 2
2 [[,]] wherein each slot contains six pilot symbols (0, 1, 2, 3, 4,

5), said first known channel coefficient of abscissa A is the coefficient $C(5) = C_I(5) + jC_Q(5)$ corresponding to the last pilot symbol (5) of the current slot (L), said second known channel coefficient of abscissa B is the coefficient $C(10) = C_I(10) + jC_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L + 1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(4) = C_I(4) + jC_Q(4)$ corresponding to the last but one pilot symbol (4) of the current slot (L), and the computation of the channel coefficients $C(k) = C_I(k) + jC_Q(k)$, with $k = 6..9$, is performed according to following sequence:

$$C_I(7) = [C_I(4) + C_I(10)]/2; C_Q(7) = [C_Q(4) + C_Q(10)]/2;$$

$$C_I(6) = [C_I(5) + C_I(7)]/2; C_Q(6) = [C_Q(5) + C_Q(7)]/2;$$

$$C_I(8) = [C_I(6) + C_I(10)]/2; C_Q(8) = [C_Q(6) + C_Q(10)]/2;$$

$$C_I(9) = [C_I(8) + C_I(10)]/2; C_Q(9) = [C_Q(8) + C_Q(10)]/2.$$

7. (currently amended) The method according to claim 2 [[,]] wherein each slot contains seven pilot symbols (0, 1, 2, 3, 4, 5, 6), said first known channel coefficient of abscissa A is the coefficient $C(6) = C_I(6) + jC_Q(6)$ corresponding to the last pilot symbol (6) of the current slot (L), said second known channel coefficient is the coefficient $C(10) = C_I(10) + jC_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L + 1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(5) = C_I(5) + jC_Q(5)$ corresponding to the last but one pilot symbol (5) of the current slot (L), and the

11 computation of the channel coefficients $C(k) = C_I(k) + jC_Q(k)$, with
12 $k = 7..9$, is performed following the sequence:

13 $C_I(8) = [C_I(6) + C_I(10)]/2$; $C_Q(8) = [C_Q(6) + C_Q(10)]/2$;

14 $C_I(7) = [C_I(6) + C_I(8)]/2$; $C_Q(7) = [C_Q(6) + C_Q(8)]/2$;

15 $C_I(9) = [C_I(8) + C_I(10)]/2$; $C_Q(9) = [C_Q(8) + C_Q(10)]/2$.

1 8. (currently amended) The method according to claim 2,
2 wherein each slot contains eight pilot symbols (0, 1, 2, 3, 4, 5,
3 6, 7), said first known channel coefficient of abscissa A is the
4 coefficient $C(7) = C_I(7) + jC_Q(7)$ corresponding to the last pilot
5 symbol (7) of the current slot (L), said second known channel
6 coefficient of abscissa B is the coefficient
7 $C(10) = C_I(10) + jC_Q(10)$ corresponding to the first pilot symbol
8 (10) of a subsequent slot (L + 1), and said third known channel
9 coefficient of abscissa A-1 is the coefficient $C(6) = C_I(6) + jC_Q(6)$
10 corresponding to the last but one pilot symbol (6) of the current
11 slot (L), and the computation of the channel coefficients
12 $C(k) = C_I(k) + jC_Q(k)$, with $k = 8, 9$, is performed according to the
13 sequence:

14 $C_I(8) = [C_I(6) + C_I(10)]/2$; $C_Q(8) = [C_Q(6) + C_Q(10)]/2$;

15 $C_I(9) = [C_I(8) + C_I(10)]/2$; $C_Q(9) = [C_Q(8) + C_Q(10)]/2$.

1 9. (currently amended) The method according to claim 17
2 [[,]] wherein said channel coefficients to be calculated are
3 comprised between a first known channel coefficient of abscissa A,
4 corresponding to a last pilot symbol of a current slot (L), and a

5 second known channel coefficient of abscissa B, corresponding to a
6 first pilot symbol of a slot (L + 1) subsequent to said current
7 slot, ~~being additionally known~~ a third channel coefficient of
8 abscissa B + 1 ~~[[,]]~~ being on the right hand of said first channel
9 coefficient of abscissa B, and the computation of said channel
10 coefficients is performed through by the steps of:

11 a) ~~repeatedly applying, in a recursive manner, said~~
12 ~~interpolation algorithm in the interval defined by said known~~
13 ~~channel coefficients of abscissa A and B, by carrying out a first~~
14 ~~iteration in the interval defined by the known channel coefficients~~
15 ~~of abscissa A and B in which a first intermediate coefficient (of~~
16 ~~abscissa C) is calculated and [[by]] performing subsequent~~
17 ~~iterations of the same algorithm in sub-intervals defined from time~~
18 ~~to time on the right-hand by said known channel coefficient of~~
19 ~~abscissa B and on the left-hand by the intermediate coefficient~~
20 ~~derived~~ calculated in the preceding iteration, until the abscissa
21 point B - 1 is reached and calculated;

22 b) searching, by decreasing abscissas, for a first point
23 still to be calculated on the left-hand of the last intermediate
24 coefficient calculated; defining ~~, as extremes of a new application~~
25 ~~interval of said interpolation algorithm,~~ having on the left side
26 the first known left hand point and on the right side the first
27 known right-hand point with respect to said point still to be
28 calculated; and further applying, in a recursively calculating
29 further iterations of the method in manner, said interpolation
30 algorithm on said new interval [[,]] by carrying out subsequent

31 ~~iterations of the same algorithm~~ in sub-intervals defined from time
32 to time by the right hand extreme of said new interval and by a
33 left hand extreme formed by the intermediate coefficient derived in
34 the previous iteration, until the point immediately adjacent to the
35 right hand extreme of said new interval is reached and calculated;
36 and

37 c) repeating step b) until the channel coefficient
38 associated to the value of abscissa $A + 1$ is calculated.

1 10. (currently amended) The method according to claim
2 16, wherein said channel coefficients to be calculated are
3 comprised between two known left-hand channel coefficients (A - 1,
4 A) $[[,]]$ corresponding to the last two pilot symbols of a current
5 slot (L), and two known right-hand channel coefficients $[[,]]$ (B, B
6 + 1) corresponding to the first two pilot symbols of a slot (L + 1)
7 subsequent to said current slot, and the computation of said
8 channel coefficients is performed by applying the first time ~~said~~
9 ~~interpolation algorithm~~ iterative method of claim 16 for
10 calculating an intermediate coefficient, thus dividing into two
11 sub-intervals the interval comprised between said known left-hand
12 channel coefficients and said known right hand channel
13 coefficients, and by subsequently applying $[[,]]$ in parallel $[[,]]$
14 to said ~~sub-intervals said interpolation algorithm~~ the iterative
15 method of claim 16 for computing the remaining channel coefficients
16 comprised in each of said sub-intervals.

1 11. (currently amended) The method according to claim
2 16 [[,]] wherein at least one known point of said first or second
3 extreme is a point which has been obtained through a linear
4 combination of known channel coefficients.

1 12. (currently amended) The method according to claim
2 16 [[,]] wherein said communications network is a radio mobile
3 telecommunications network of UMTS type.

1 13. (currently amended) A device for the estimation of
2 the transfer function of a transmission channel in a receiving
3 system for a telecommunications network, the device comprising:

4 a memory ~~(100)~~ capable of means for storing channel
5 coefficients corresponding to a current slot (L) and at least one
6 channel coefficient corresponding to a slot (L + 1) subsequent to
7 said ~~original~~ current slot (L);

8 interpolation means ~~(104, 106, 108, 110)~~ capable of for
9 reading from said memory means ~~(100)~~ a first and [[a]] second
10 operands [[,]] corresponding to known channel coefficients [[,]]
11 and [[of]] for writing into said memory [[(100)]] means a value
12 corresponding to the arithmetic average between said first and
13 second operand, said value corresponding to a new channel
14 coefficient;

15 [[a]] logic control unit ~~(102)~~ means for addressing in
16 reading and writing (R/W) said memory [[(100)]] means and for
17 controlling said interpolation means ~~(104, 106)~~, so as to perform

18 through individual interpolation operations [[,]] the computation
19 and the storage into such memory [[(100)]] means of individual
20 channel coefficients, ~~characterized in that~~ said logic control
21 ~~unit (102) carries original~~ carrying out a series of interpolation
22 operations according to the method described in claim 16.

1 14. (currently amended) A radio base station [[,]] of
2 the type comprising a Rake receiver for receiving signals coming
3 from mobile terminals [[,]] and equipped with a device for the
4 estimation of the transfer function of a transmission channel
5 through the computation of a plurality of channel coefficients,
6 ~~characterized in that said the~~ estimation of the transfer function
7 [[is]] being performed ~~original~~ according to the method described
8 in claim 16.

1 15. (currently amended) A mobile terminal [[,]] of the
2 type comprising a receiver for the reception of signals coming from
3 a radio base station [[,]] and equipped with a device for the
4 estimation of the transfer function of a transmission channel
5 through the computation of a plurality of channel coefficients,
6 ~~characterized in that said the~~ estimation of the transfer function
7 [[is]] being performed according to the method described in claim
8 16.

1 16. (new) An iterative method of estimating channel
2 coefficients by interpolation between known channel coefficients,

3 the coefficients being identified by integer abscissa values on a
4 time axis, the known coefficients comprising at least two
5 coefficients with adjacent values $x-1$ and x at the left side of an
6 interval and at least one coefficient with abscissa value y at the
7 right of the interval, wherein one iteration of the method
8 comprises

9 calculating an abscissa value as $z = L(x + y) / 2j$, and
10 calculating the coefficient with abscissa z as the
11 arithmetic mean of the coefficients with abscissae values x and y ,
12 if $x + y$ is even, and as the arithmetic mean of the coefficients
13 with abscissae values $x-1$ and y , if $x + y$ is odd, the coefficient
14 with abscissa z constituting a known coefficient for any further
15 iterations.

1 17. (new) An iterative method of estimating channel
2 coefficients by interpolation between known channel coefficients,
3 the coefficients being identified by integer abscissa values on a
4 time axis, the known coefficients comprising at least one
5 coefficient with abscissa value x at the left side of an interval
6 and at least two coefficients with adjacent values y and $y + 1$ at
7 the right of the interval wherein one iteration of the method
8 comprises

9 calculating an abscissa value as $z = [(x + y) / 2]$, and
10 calculating the coefficient with abscissa z as the
11 arithmetic mean of the coefficients with abscissae values x and y ,
12 if $x + y$ is even, and as the arithmetic mean of the coefficients

13 with abscissas values x and $y + 1$, if $x + y$ is odd, the coefficient
14 with abscissa z constituting a known coefficient for any further
15 iterations.

1 18. (new) The method according to claim 17 wherein the
2 channel coefficients to be calculated are comprised between two
3 known left-hand channel coefficients ($A - 1, A$) corresponding to
4 the last two pilot symbols of a current slot (L), and two known
5 right-hand channel coefficients ($B, B + 1$) corresponding to the
6 first two pilot symbols of a slot ($L + 1$) subsequent to the current
7 slot, and the computation of the channel coefficients is performed
8 by applying the first time iterative method of claim 16 for
9 calculating an intermediate coefficient, thus dividing into two
10 sub-intervals the interval comprised between the known left-hand
11 channel coefficients and the known right hand channel coefficients,
12 and by subsequently applying in parallel to the iterative method of
13 claim 16 for computing the remaining channel coefficients comprised
14 in each of the sub-intervals.

1 19. (new) A device for the estimation of the transfer
2 function of a transmission channel in a receiving system for a
3 telecommunications network, the device comprising:
4 a memory means for storing channel coefficients
5 corresponding to a current slot (L) and at least one channel
6 coefficient corresponding to a slot ($L + 1$) subsequent to the
7 current slot (L);

8 interpolation means for reading from the memory means
9 first and second operands corresponding to known channel
10 coefficients and for writing into the memory means a value
11 corresponding to the arithmetic average between the first and
12 second operand, the value corresponding to a new channel
13 coefficient;

14 logic control means for addressing in reading and writing
15 (R/W) the memory means and for controlling the interpolation means
16 so as to perform through individual interpolation operations the
17 computation and the storage into such memory means of individual
18 channel coefficients, the logic control carrying out a series of
19 interpolation operations according to the method described in claim
20 17.

1 20. (new) A radio base station of the type comprising a
2 Rake receiver for receiving signals coming from mobile terminals
3 and equipped with a device for the estimation of the transfer
4 function of a transmission channel through the computation of a
5 plurality of channel coefficients, the estimation of the transfer
6 function being performed according to the method described in claim
7 17.

1 21. (new) A mobile terminal of the type comprising a
2 receiver for the reception of signals coming from a radio base
3 station and equipped with a device for the estimation of the
4 transfer function of a transmission channel through the computation

5 of a plurality of channel coefficients, the estimation of the
6 transfer function being performed according to the method described
7 in claim 17.